Washington State Department of Transportations (WSDOT)
Bridge and Structures Office
Response to;
Federal Highway Administration Docket Number FHWA-2001-8954
National Bridge Inspection Standards
Advanced Notice of Proposed Rule Making

Comments as follows;

1) If the primary purpose of the NBIS is to locate, evaluate, and act on existing bridge deficiencies to insure the safety of the traveling public. Then it should be extended to all structures and portions of structures that have the potential to impact the safety of the traveling public. Examples of other elements, which are not currently covered or reported to the NBIS, are sign structures, mechanical and electrical components of moveable bridges, tunnels, culverts, retaining walls and ferry terminal spans and machinery.

2) The NBIS should be reported in English dimensional units only!

3) *Should the FHWA develop its own definition of a bridge for the purpose of inspection and reporting? Should the FHWA definition change the way the bridge length is determined or what the minimum bridge length should be for reporting purposes? What impact will the possible inclusion of more bridges be (1) on public authorities complying with this as an NBIS requirement, (2) or on the FHWA, which maintains the inventory, (3) or on the HBRRP funds?*

   A simplification of the measurement of bridge length should be implemented. Undercopings opening are not convenient to measure. We suggest that a measurement method applicable to the roadway deck and consistent with dimension on the plans be selected. We suggest the "structure length" as defined under Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges.

   WSDOT has developed it's own definition for determining "bridges" that separate them from "culverts" which we inspect but do not report to FHWA. We suggest this criterion be considered, possibly in a simpler definition, for the determination of reporting. The following is the WSDOT criteria;

   Short Span Bridges

   The WSDOT has concluded that many highway structures with openings less than 20 feet require regular inspection to meet the intent to locate, evaluate, and act on existing bridge deficiencies to ensure the safety of the traveling public (23 U.S.C. 151). WSDOT has developed a "Short Span Bridge" definition that is incorporated in the state's Bridge Inspection Manual. This definition is attached.

   This response suggests that the FHWA definition of a bridge be changed to incorporate WSDOT's "Short Span Bridge" definition.

8.01 General

Short span bridges have an opening of 20 feet or less. This is measured along the center of the roadway between undercopings of abutments, spring lines of arches, or extreme ends of openings for multiple boxes. Short span bridges may also include multiple pipes, but the clear distance between openings must be less than half of the smaller contiguous opening.

Short span bridges are not eligible for federal replacement funding, nor are they generally reported in the National Bridge Inventory (NBI). However, certain short span bridges located on the STRAHNET (defense highways), must be inspected, inventoried, and reported to the NBI. Those bridges meeting one of the following criteria must be inspected, inventoried, and reported to the NBI. Those bridges meeting one of the following criteria must be inspected and reported:

1. Curb-to-curb deck width less than one-fourth of the approach roadway width, or
2. Minimum vertical clearance less than 18 feet, or
3. Operating rating less than an HS-10 loading.

Even for those short span bridges which are not required to be reported to the NBI, there remains concern about their deterioration and performance. Therefore, it is recommended that agencies inspect short span bridges. The frequency of the inspections for these bridges will be at the discretion of the inspection agency.

8.02 Criteria

In addition to the required inspection of STRAHNET short span bridges, routine inspections are recommended for the following short span bridges provided the depth of fill (if present) is less than half the span opening and:

- Timber with a span from 4 feet through 20 feet (Appendix A and B).
- Single span concrete or steel with a span from 6 feet through 20 feet (Appendix A and B).
- Multiple span with a total length from 8 feet through 20 feet (Appendix C).
- Steel corrugated pipes with an opening greater than 8 feet (Appendix D).
- Multiple pipes with out to out dimension from 10 feet to 20 feet (Appendix E).

Take the skew angle into account when determining the bridge length (open span length along the centerline of the roadway (see Appendix F).

The previous criteria is presented as a guideline and is not intended to replace sound engineering judgment. When in doubt, a conservative approach should be taken.

A. Short Span Bridges Inspected

If the short span bridge is inspected, agencies should follow these guidelines on reporting:

1. Fill in the required fields listed on the Washington State Bridge Inventory System (WSBIS) Inventory Coding Form. The bridge number should be an unique number for short span bridges.

Structure ID (WSDOT assigns)	Curb To Curb Deck Width
Bridge Number	Out To Out Deck Width
Owner Code	Min. Vert. Clearance Over Deck
County Number	Inventory Route
City Number	- On/Under
Update	- Hwy Class
Location	- Serv Level
Section	Route Number
Township	Milepost
Range	ADT On Inventory Route
Latitude	Fed Hwy System
Longitude	Strahnet
Features Intersected	Federal Funct. Class
Facilities Carried	National Truck Net
Region	Lane Use Direction
Toll	Horizontal Clearance Rte. Direction
Custodian	Detour Length
Parallel Bridge	Year Built
Bridge Length	Main Span Type
Maximum Span Length	Number of Main Spans
Lanes On	Service On
Lanes Under	Service Under

2. Take deck and elevation photographs (label and date).
3. Fill out the Bridge Scour Evaluation form (if applicable).
4. Complete a Bridge Inspection Report.
5. Determine the frequency of inspection needed. Suggested maximum frequency is 72 months.
6. Submit the data through normal procedures.

B. Short Span Bridges Not Inspected

If the short span bridge is not inspected, the following are some guidelines to follow:

1. WSDOT Inspectors should note the milepost, type of bridge, features carried, features intercepted, take elevation and deck photographs, and notify maintenance personnel that future inspections of the bridge are their responsibility.
2. Local Agency Inspectors need to determine whether any future inspection of the bridge is necessary and coordinate with their maintenance personnel.

8.03 Inspections

The inspection procedures for the short span bridges are the same as the National Bridge Inspection Standards (NBIS) bridges (see Chapter 3).

An underwater inspection is performed on short span bridges with structural elements underwater. If the inspector is unable to assess the condition of the elements either visually or by probing, a diver must conduct the underwater inspection. This inspection determines the structural condition and adequacy of the short span bridges underwater elements.

8.04 Bridge Files

The minimum information maintained in the bridge file includes:

1. Inventory data, including location maps.
2. Completed inspection forms.
3. A sketch of the bridge showing dimensions.
4. Deck and elevation photographs (labeled and dated).
5. Scour Evaluation Form (if applicable).
6. Correspondence.

8.05 Reporting

Following the inspection procedures used on NBIS bridges insures uniformity of reporting. State-owned bridges are added to the WSDOT Bridge List while local agency bridges are added to their own local inventories.

After the bridges are inspected, the procedures for creating and updating the WSBIS inventory are followed.

8.06 Appendixes

8.06-A Bridge With Fill on Deck

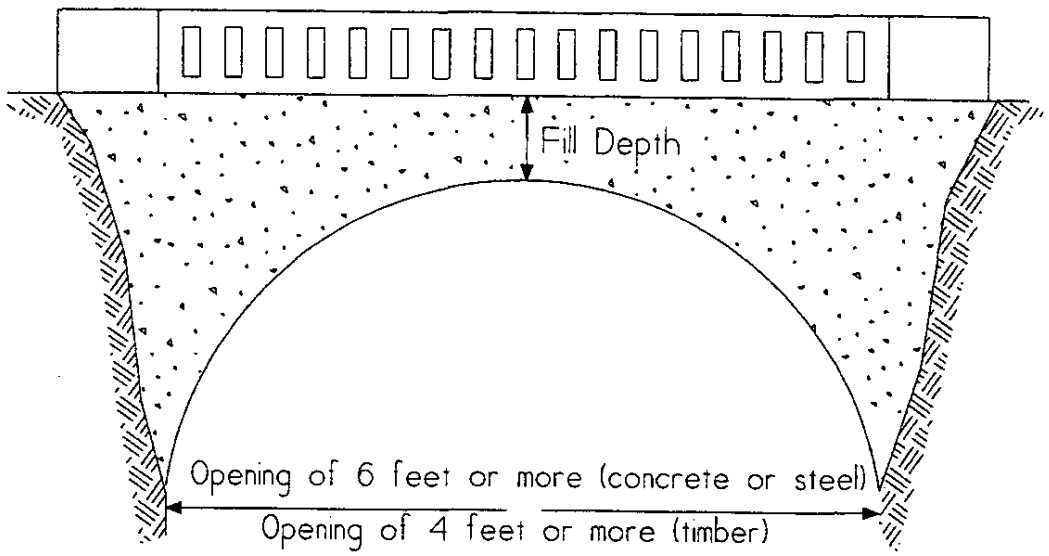
8.06-B Bridge With No Fill on Deck

8.06-C Culvert With Fill on Deck

8.06-D Single Pipe Culvert

8.06-E Pipe in a Series

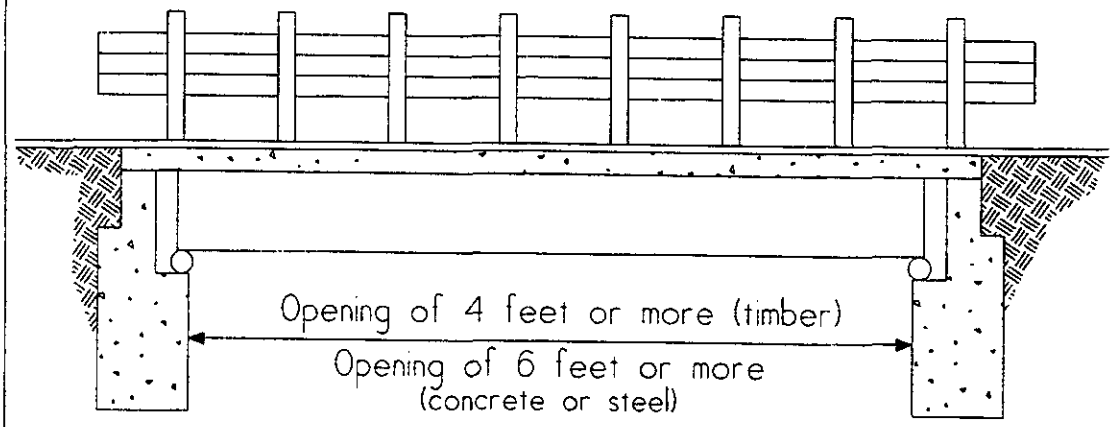
8.06-F Pipes in a Series With a Skew



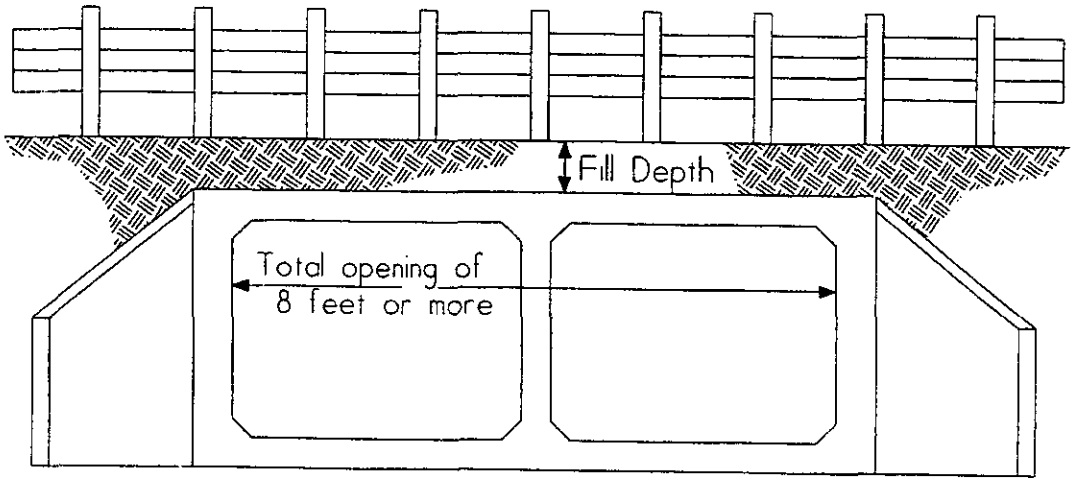
Depth of fill must be less than D/2 (where D = maximum opening distance)

Bridge with Fill on Deck

NOTE: A bridge is a structure built on a foundation (with no invert structural bottom)



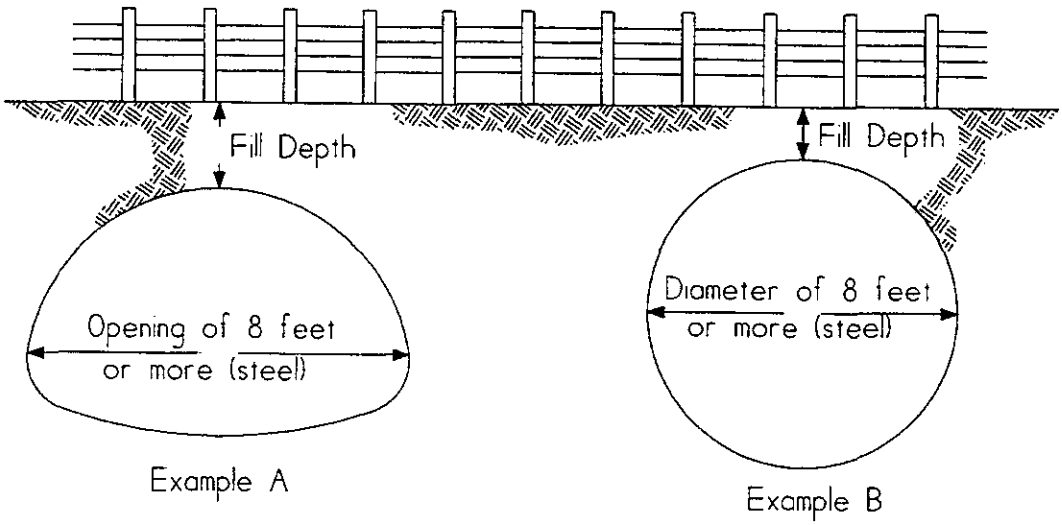
Bridge with No Fill on Deck



Depth of fill must be less than D/2 (where D = total opening)

Culvert with Fill on Deck

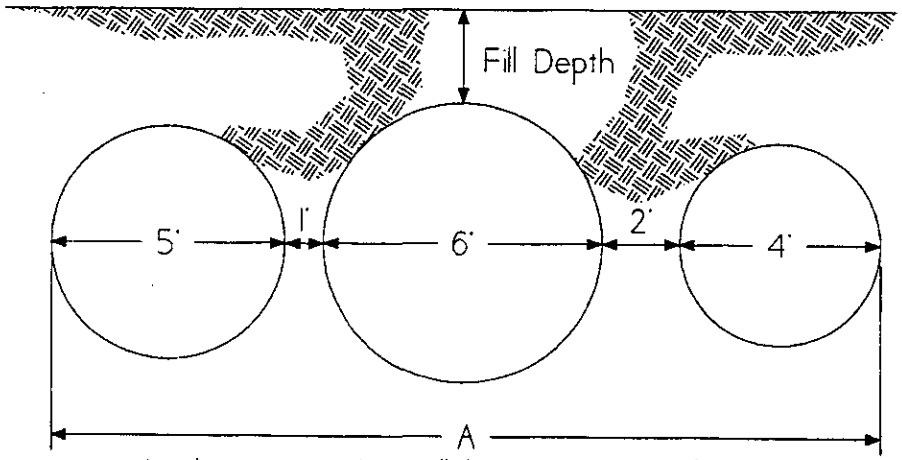
NOTE: A culvert has no structural foundation and has a structural bottom. It is a structure designed to operate at peak flows with a submerged inlet and to support the dead load of fill material (which adds structural stability) as well as the live loads of traffic.



Depth of fill must be less than D/2
(where D = pipe diameter or opening)

Single Pipe Culvert

NOTE: A pipe is a structure that is oval or circular in shape.



(to be measured parallel to centerline of roadway)

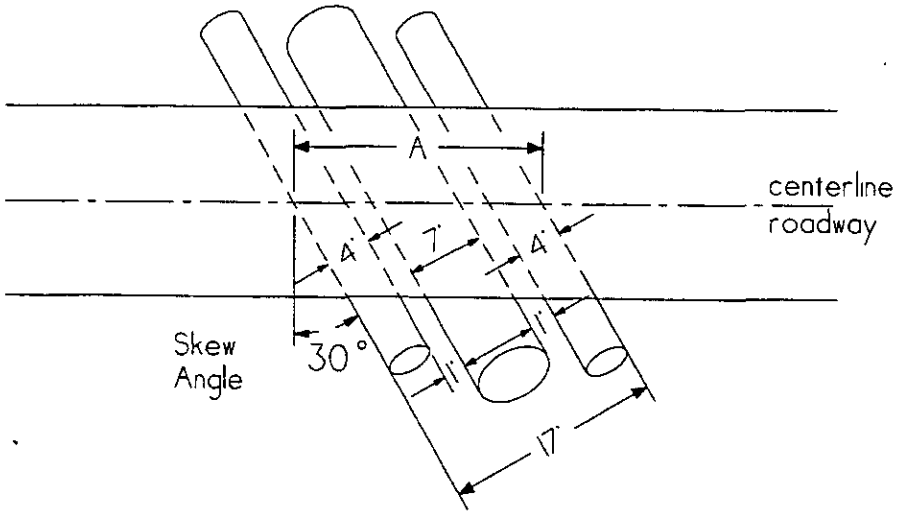
A = 18'

For pipes in a series, the following criteria apply:

1. Distance between pipes must be less than d/2 (where d = diameter of smallest pipe in series); AND
2. Fill on top must be less than D/2 (where D = diameter of largest pipe).

Pipes in a Series

Note: For pipes in a series with a skew, see Appendix 8.06-F for determining "A" distance correctly.



$$A = \frac{17'}{\cos 30^\circ} = 19.63'$$

Pipes in a Series with a Skew

The change in criteria will increase the effort required by agencies and thus have some impact. However, the impact within Washington State is believed to be minimal. Reporting length can be distinguished form HBRRP funds length.

4) *The AASHTO ''Manual for Maintenance Inspection of Bridges'' will be used for determining load ratings for each bridge*;

"Load Rating" of bridges needs to include the LRFR method.

5) A listing of bridges with fracture critical members along with information on location, description and inspection frequency must be maintained;

Fracture Critical inspection frequency should have some flexibility which the agency's can apply other than the close inspection of elements on a 24 month frequency. The definition of Close visual "hands-on" inspection needs to be clarified and quantified. Additionally, there is a growing demand to inspect structures at night (in the dark). Criteria should be set to guide inspection lighting for proper visual inspection.

6) Based on comments from bridge engineers, the FHWA is considering changing the 5 year underwater inspection intervals and developing intervals which are tied to pile or foundation materials as well as the environment where the bridge is located.

WSDOT supports the changing of the inspection frequency of under water inspections. The proposed direction of setting the frequency as related to foundation type and environmental condition is a good direction. WSDOT is willing to provide data to assist in identifying the appropriate criteria. This change will be an effort reduction and beneficial to agency's.

7) Scour Vulnerable Bridges

a. Bridge foundations with limited/partial scour observed

Summary

This response is directed toward improving the bridge inspection procedures to more accurately and effectively report scour critical bridges with evident scour. Furthermore, this response seeks to provide a mechanism to include this condition in the formula that makes bridges eligible for replacement.

References

This document refers to Report Number FHWA-PD-96-001 Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (SIA).

Response

The particular class of bridges addressed in this response are those with unknown foundations or those considered "Scour Critical" (SIA Item 113 coded a 6, 3 or 2 that have evidence of active scour in the foundations but have not yet been structurally compromised by the scouring action. This would apply to situations where the scour vulnerable footings are exposed or even have some undermining, but for which the

effective bearing area of the footings are still considered adequate for the anticipated structural loads.

In addition to cases where scour is found during inspection, there are also situations where a previously observed scour hole has simply filled in due to natural stream channel changes, or where a scour condition was inadequately repaired. These represent situations where the scour vulnerability is hidden but not corrected.

Under these circumstances, the bridge is extremely vulnerable to scour but is not structurally unstable. In accordance with FHWA direction, it is not possible to reflect this condition in the primary structural elements (usually SIA Item 60 – Substructure) and there is no other appropriate location within the SIA to code this condition. For background information, the following is a portion of a correspondence between WSDOT and Barry Brecto, PE, FHWA, Division Bridge Engineer, Washington Division sent to the WSDOT on December 4, 2001;
"Just because the scour code (Item 113) is a 2, 3, or 6, the substructure code should not be dropped to a 3. The code should be assigned based on the actual condition of the substructure, taking into account the degree of scour of the foundation. For a substructure, taking into account the degree of scour of the foundation. For a substructure whose load carrying capacity is not reduced and is not unstable, scour could drop the substructure code to a 5 (Fair Condition). A code of 4 (Poor Condition) would be appropriate if the scour had undermined the foundation to the point the load carrying capacity of the pier or abutment had been reduced, or it was potentially unstable. If local failure of the foundation or substructure element were possible, it would be best coded a 3 (Serious Condition)."
As a consequence, it is difficult to track these bridges within the SIA coding system, and it is not possible to incorporate this condition in the Sufficiency Rating (SR), which prioritizes replacement candidates.

This response seeks to raise this issue and requests that the bridge inspection and recording procedures be amended to provide a method to document scour vulnerable bridges with scour or with a known history of scour that has not been adequately repaired. In addition to providing a method to document the condition, it is also requested that extreme scour vulnerability be a basis for a reduction in the Sufficiency Rating, providing a mechanism for giving these structures a higher priority for replacement.

b. Temporary Scour Repair

Summary

This response is directed to improving the bridge inspection procedures to more accurately and effectively report scour critical bridges with temporary riprap scour repairs.

Reference

FHWA-PD-96-001 Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (SIA)

Response

The particular class of bridges addressed in this response are those with temporary riprap repairs at pier/abutment foundations of those considered "Scour Critical" (SIA Item 113) that have had active scour in the foundations and repaired with riprap but have not yet been repaired with a more permanent counter measure. This would apply to situations where the scour vulnerable footings had been exposed or even have some undermining, but are now protected with riprap.

Under these circumstances, the bridge is vulnerable to scour but only during extreme events. In accordance with FHWA direction, it is not possible to reflect this condition in the scour code (SIA Item 113) and there is no other appropriate location within the SIA to code this condition. As a consequence, it is difficult to track these bridges within the SIA coding system, and it is not possible to incorporate this condition in the Sufficiency Rating (SR), which prioritizes replacement/rehab candidates. It is requested that a new code be incorporated into Item 113 to reflect this condition.

c. NBIS adoption of FHWA Technical Advisory T 5140.23

Summary

This response is directed at addressing inclusion of T 5140.23 within the NBIS regulations.

References

T 5140.23
HEC 18 Evaluating Scour at Bridges
HEC 23 Bridge Scour and Stream Instability Countermeasures
National Environmental Policy Act (42 USC 4321-4347)

Response

Technical advisory T 5140.23 should be included in the NBIS regulations with a few additions. HEC 23 should be included/referenced in the advisory. The information in HEC 23 is best available science at this time. The state of Washington already follows this advisory and the impact would be minimal.

Under ESA any impacts of critical habitat to listed species have to be addressed. If T 5140.23 is included in the NBIS regulations then the impacts to critical habitat to listed species will have to be addressed at the federal level. Addressing impacts for scour repairs at the state and local level has a tremendous cost in manpower and money.

d. Underwater Inspections

Summary

This response is directed at the requirements for those people performing underwater inspections.

Reference

23 USC 151

Response

The state of Washington uses the following qualifications and requests that the qualifications under NBIS be the same. Using a registered engineer for all the underwater inspections would be cost prohibitive especially for local agencies.

Qualifications of inspection personnel shall be in accordance with the following:

A. The Engineer in charge of the inspection and preparation of the inspection report must posses the following minimum:

   1. Registered professional engineer in the State of Washington.

   2. Five years experience in underwater structure inspection assignments in a responsible capacity.

   3. If performing the actual underwater inspections, must be a certified diver as recognized by OSHA, WISHA, and United States Coast Guard requirements.

   4. Must be on site at all times, participating in the inspections. If not performing the underwater inspection as a diver, must be in constant communications with the diver performing inspections.

   5. Must obtain a Washington State Bridge Inspectors Identification Number. This number is required on the inspection reports.

B. The diver(s) that perform the inspection shall meet qualifications as a bridge inspector in accordance with the NBIS and be a certified diver as recognized by OSHA, WISHA, and United States Coast Guard requirements.

C. All site personnel shall comply with all laws, ordinances, rules, regulations and orders of any public authority bearing on the performance of the work. Standards for Commercial Diving Operations, Chapter 296-37 Washington Administrative Code for Federal Commercial Diving Safety and Health Standards 29 CFR part 1910 subpart T shall be observed as necessary. Exceptions to "on-site personnel" is limited exclusively to office clerical, secretarial, security or data processing employees who are not covered by a State Workers Compensation Act, 33 USCA & 902(3).

8) Frequency of Inspection

Should the 4-year interval be increased so that more bridges would be eligible for the extended inspection cycle?

No. The 4-year frequency should not be increased. However, WSDOT suggest the approval process for exceeding the 2-year interval should be revisited. In its place the regulations should state the criteria that must be met for a 4-year interval. Each agency could then make their determination of which bridges to inspect on the 48-month interval. This would avoid the present lengthy review process with FHWA.

We recommend the following criteria:

1. Common Designs – Concrete Bridges and concrete or steel culverts
    a. Prestressed girders
    b. Box girders
    c. Slabs
    d. T-beams
    e. Post-tensioned box girders
    f. Concrete culvert
    g. Steel culvert

2. Condition Ratings
    a. Superstructure greater than 6
    b. Substructure greater than 6
    c. Deck greater than 6
    d. Culvert greater than 6

3. Inventory Load Ratings
    a. All bridge inventory ratings are greater than or equal to state legal loads.

4. Vertical Under clearances greater than 14' 6" (WSDOT maximum legal height = 14'-0")

5. Bridges over water
    a. Not scour critical – Scour Code 5, 8, 9, T or N.
    b. Channel and channel code 6 or greater.

6. The maximum span length is equal to or less than 150 feet.

7. The maximum ADT is 100,000 vehicles and the ADTT 10,000.

8. No major maintenance has been performed in the last two years.

What impact would this have on the safety of bridges?

None. Bridges that meet our proposed criteria have a history of being very safe with slow rates of deterioration. The following number of bridges that qualify for 48-month inspection frequency: Using current approved criteria (same as proposed except spans less than 100')
State Bridges = 225 (there were 233 on approved list in 1998)
Local Agency Bridges = 162 (they are not presently using 48 months)
Using proposed criteria
State Bridges = 365
Local Agency Bridges = 164

9) Qualifications of Inspection Personnel

   a. *Should the individual in charge of the inspection and reporting who is a PE be required to have the same training as bridge inspectors and have additional experience in bridge inspection?*
   Yes, WSDOT requires Structural Licensing as well as experience. This should be measured relative to the complexity of bridges with in the states inventory. State's having large structures of complex design should be managed by a licensed structural engineer.

10) *Should the NBIS regulation be more specific as to the discipline of the professional engineer responsible for these bridge inspections and what impact would this change have on public authorities complying with this?*

   Yes, The NBIS should quantify the specific license discipline respective to the items to be inspected. Civil, Structural, Mechanical and Electrical licenses should be required for the respective elements and type of bridge. This would be compliant with the state law regulating the practice of engineering. Public authorities should be utilizing these criteria today.
   Additionally, the NBIS needs to clearly identify "experience in bridge inspection".

11) *The FHWA is considering requiring certification training in proportion to the complexity of the bridge structure being inspected, and making this a part of a requirement for inspectors under the national bridge inspection program. What impact would this change have on public authorities complying with this as an NBIS requirement?*
   Certification should be set by each agency or state. FHWA should not dictate certification through the NBIS.

12) *What if any would the impact be on public authorities complying with only allowing the inspector who was out in the field to change the inspection report as an NBIS requirement?*

   WSDOT agrees with one exception that allows general editorial changes to text that will not change the context of the statement. WSDOT's current policy is to have the changes coordinated through the lead inspector.

13) *Should the reporting requirements for the NBIS be changed and what, if any, would the impact be on public authorities complying with this?*

   Ok as is.

Additional General Questions

14) *In our effort to facilitate review of this NBIS regulation, the FHWA seeks comments on the following additional questions:*
   a. *Does the current regulation at 23 CFR part 650, subpart C, correctly address the requirements of 23 U.S.C. 151, national bridge inspection program?*

   b. *What improvements would you recommend to the bridge inspection procedures?*

   FHWA should consider the addition of regulations and reporting of the inspection of any structural element that can impact the safety to the public. Some considerations would be

adding requirement for sign structures, mechanical and electrical components on movable structures, tunnels and retaining walls.

c. *What specific procedures would you recommend to enhance the NBIS regulations?*